Winter 1977

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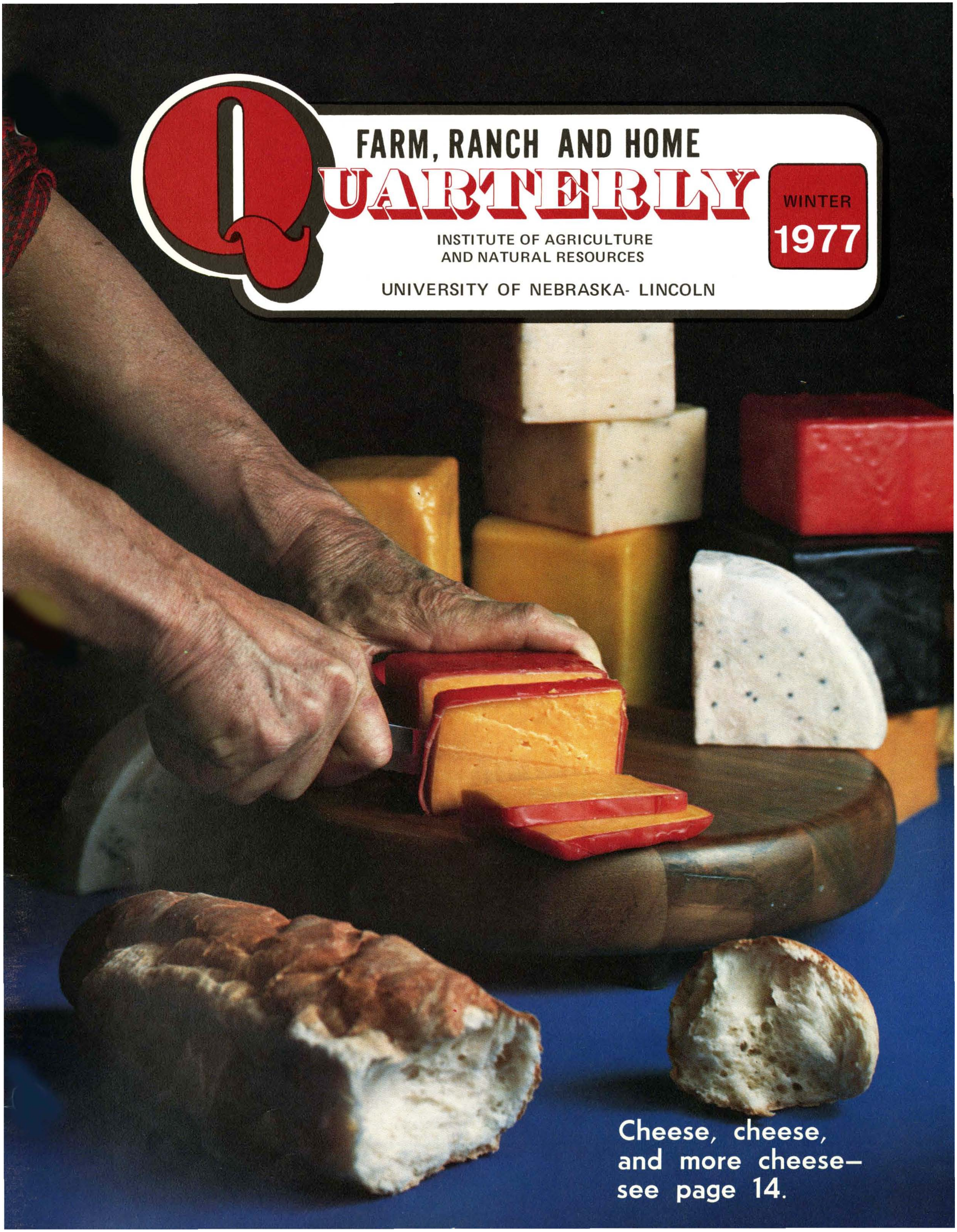
FARM, RANCH AND HOME

QUARTERLY

WINTER 1977

INSTITUTE OF AGRICULTURE
AND NATURAL RESOURCES

UNIVERSITY OF NEBRASKA- LINCOLN



Cheese, cheese, and more cheese— see page 14.

Farm, Ranch and Home

QUARTERLY

Winter 1977 Vol. 23, No. 4

In this issue:

On the cover:

Cheese is made on the University's East Campus in the Food Pilot Plant. Students work in the plant and the products are sold in what is fondly known as the "Dairy Store!" (Photo by Dick Dodds)

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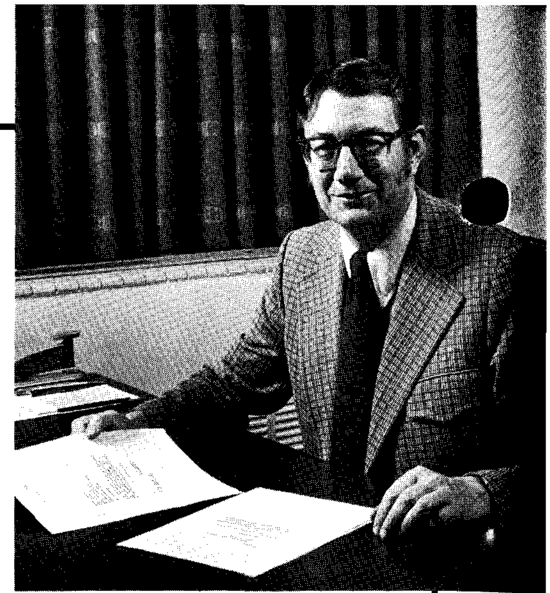
A Quarterly Feature

A Message from the Vice Chancellor



M. A. Massengale

Water is one of those things—like so many in our society—that we tend to take for granted when it is in ample supply. After a few dry years, we hear overtones of "the well is drying up. . . ."

We have experienced a few dry years in Nebraska recently, and we have occasionally heard the voices of the prophets of doom. Nebraska is fortunate to have large quantities of underground water, so it is not a time for panic.

It is, however, a time for continued research on, and applications of, practices that will conserve and yet make the best possible use of our water. We cannot afford to take our water resources for granted. If we do, we must accept the consequences.

The use of water for irrigation, recreation, industrial and municipal purposes has increased in recent years. The demand for water is expected to continue to increase in the years ahead.

Nebraska is one of the leading states in the nation in irrigated acreage. It costs money and it uses water, but the economic impact of irrigation on Nebraska's economy is astronomical: over $2 billion annually.

Concerned with Water

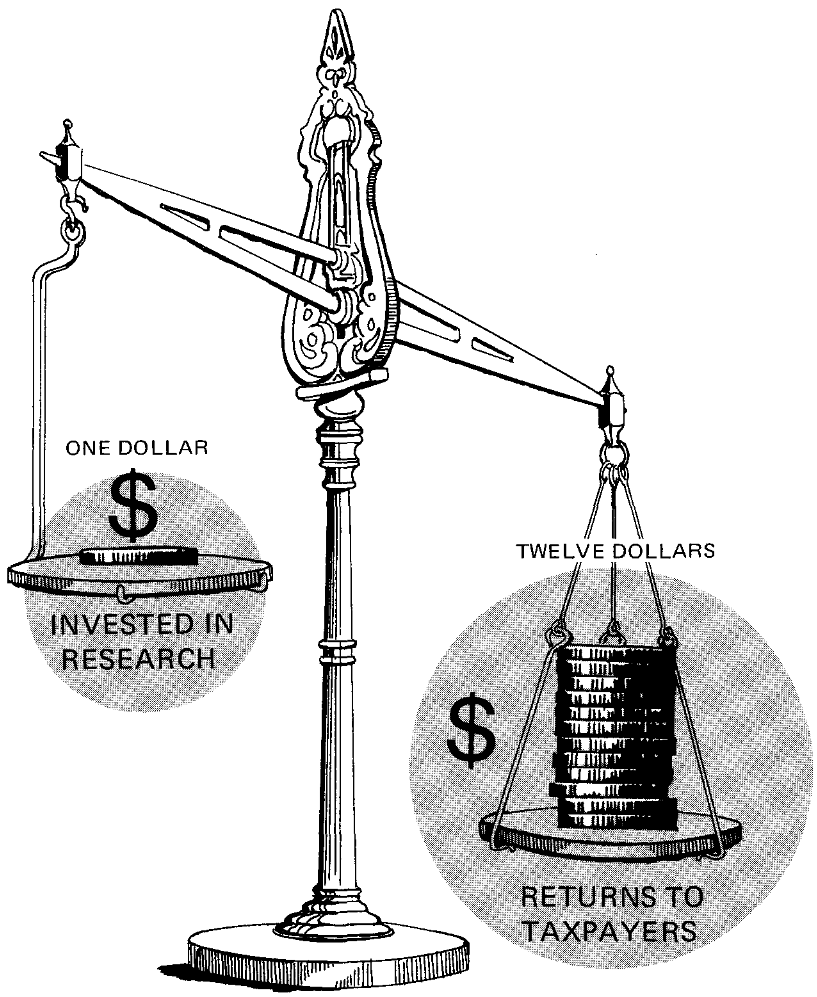
We at the Institute of Agriculture and Natural Resources are deeply concerned about our water resources, as are many citizens around the state. There are numerous units within the Institute that are engaged in water programs. They include the Nebraska Water Resources Center (formerly the Nebraska Water Resources Research Institute), the Conservation and Survey Division, Agricultural Engineering, Agricultural Economics, Agronomy, and other departments to a lesser degree.

Among the list of current projects aimed at improving water management are: multiple use of irrigation water; increasing efficiency of irrigation; programs relating to conjunctive use of water, including recreational and biological systems; ground water recharge systems; reuse facilities for irrigation water; scheduling of irrigation for energy as well as water savings; and of course the Areas of Excellence program in Water Resources Management.

We can improve on the management of our water resources, but it will take continued research, continued support, and cooperation from all Nebraskans. □

M. A. Massengale

Research Returns Tip The Scales



By H. W. Ottoson

Most of us feel fortunate when we can invest money at a 10 per cent annual return. Our Nebraska University administration, the Board of Regents, the Legislature and the Governor have recently made some investments which, according to several economists, (Griliches, University of Chicago; Evenson, University of Minnesota; Pavelis, USDA) may yield returns which challenge the imagination!

All three of these authors found returns on investments in research and extension in agriculture to be several hundred per cent (one of them, Evenson, found returns of 40 to 1, or 4,000 per cent). In recent years the University administration has recommended and the Legislature, with Governor J. James Exon's concurrence, has funded a number of new research programs in the Nebraska Agricultural Experiment Station.

It is characteristic of research programs that those that are well staffed and well funded over 5 to 10 years show the greatest payoffs. An example, but certainly not the only one, is the Wheat Breeding Research program which has been conducted since 1890. A total of some $8.6 million has been spent on this program since that time and recent calculations show a return to Nebraskans in a typical year of 976 per cent on the total 1890 to 1976 investment.

Only a part of the expenditures for new programs is for salaries of staff and technical assistants. In many cases, expensive and complex equipment is needed and this is usually best selected by the professional staff that will use it. This means that added to the recruiting time required to get new staff on board, there is often a waiting time for delivery of equipment. Also, it takes time to establish research plots, design investigations and to get the research underway. Other budget items of considerable magnitude are supplies, travel and communications.

Following is a checklist of new projects initiated during 1974, 1975 and 1976. These are divided into two groups by stages of development. The first group consists of those that have been initiated by staffing and equipping, but have not been in progress long enough to produce results that can be released.

The second group is composed of those projects which appear to already have produced publishable and/or usable results. Space does not permit a detailed discussion of results, but progress reports are available upon request from the Director's Office, Agriculture Experiment Station, East Campus, University of Nebraska Institute of Agriculture and Natural Resources, Lincoln, Nebraska 68583, or from the project scientist listed.

(Continued on next page)

GROUP I

Fiscal Year	Title of New Program or Special Support to Existing Program	Project Scientist	Status or Results
1975	Irrigation Engineer, Northeast Station	Pohl	Establishing project & developing facilities for soil & water conservation research
1975	Entomologist, Northeast Station	Witkowski	Assuming statewide leadership on corn borer research. Investigating pest management programs for Northeast Nebraska
1975	Water Economist, Ag. Ec.	Supalla	Designing project for economic evaluation of water management alternatives for Nebraska
1975	Plant Virologist, Plant Pathology	Lane	Investigating protein composition of viruses, with its effect on controlling virus disease in plants
1975	Weed Physiologist, Panhandle Station	Wilson	Investigating weed control measures in irrigated crops in western Nebraska
1975	Irrigation Engineering, Panhandle Station	Edling	Studying irrigation scheduling for water efficiency & maximum production of crops
1975	Weed Physiologist, Agronomy	Haderlie	Examining herbicide movement into plant root system
1975	Area of Excellence in crop physiology, Agronomy	Eastin	Investigating techniques for research on stress tolerant hybrids
1975	Two Graduate Assistants, Agronomy	Martin	Continuing study on interaction of soil pH and herbicide injury to soybeans
1975	Soybean Physiologist and breeder, Agronomy	Specht	Identifying improved germ plasm characteristics
1976	Research Technician, North Platte Station	Campbell	Studying management & cultural practices for control of pinkeye and flies on cattle

GROUP II

Fiscal Year	Title of New Program or Special Support to Existing Program	Project Scientist	Status or Results
1974	Range Management, Panhandle Station	Stubbendieck	Gathering data on effects of grazing systems on beef production
1974	Research Technician	White	Field tested calf scours vaccine
1974	Virologist, Vet. Science	Torres	Identified Reo-virus as cause of diarrhea in young pigs
1974	Irrigation Engineer, Ag. Eng.	Gilley	Researching interaction of nitrogen and water on irrigated crops
1974	Establish Sandhills, Ag. Lab North Platte Station	Lucas	Established research facilities for research on irrigation range management & row crops
1975	Area of Excellence, Animal Science	Lewis (visiting professor)	New ideas, analytical methods and new philosophies for swine research
1975	Technicians & Graduate Assistants, Food Science & Tech.	Satterlee	Identifying effects of processing techniques on food proteins
1975	Climatologist, Panhandle Station	Weiss	Studying evapotranspiration related to irrigation scheduling
1975	Water law specialist, Ag. Ec.	Aiken	Studying water laws in relation to agriculture
1975	Vet. Diagnostician, Panhandle Station	Darling	Established diagnostician operation for Western Nebraska research
1976	Technician, Entomology	Kindler	Screened 4,300 sorghum lines for resistance to greenbugs
1976	Support for soils research North Platte Station	Hergert	Developed & tested method of reclaiming sodic (alkali) soil determining fertilizer rates for sandy soils. Improved recommendations for zinc for corn
1976	Two Graduate Assistants, Food Science & Tech.	Satterlee & Bullerman	Increased knowledge of plant proteins
1976	Turf Management, Horticulture	Sherman	Published results on fertilization, weed and disease control in turfgrass
1976	Technician, South Central Station	Doupnik	Conducted survey of stored grains for mycotoxin and aflatoxin contents
1976	Support, South Central Station	Frank	Conducted & expanded research on costs of irrigation of row crops
1976	Weed Scientist, South Central Station	Roeth	Established research plots at Ord on musk thistles. Designed chemical application dates
1976	Ag Meteorologist, Ag. Eng.	Blad	Developed remote sensing of crop stress due to lack of water

Though it is obvious that some areas of experimentation will progress faster than others because of their very nature, the overall impression is one of excellent progress. District Directors and Department Chairmen have done an outstanding job in recruiting some fine new staff members, in adding support for existing staff and in generally performing the detail work that is needed to get new work underway.

We are optimistic that this new research will not only bear out the very favorable returns estimated by Griliches, et al. but may even improve their averages!

We are confident that the money thus spent will yield great returns for Nebraska and Nebraskans.

H. W. OTTOSON is dean and director of the Agricultural Experiment Station.

Herbicides

Broadcast or Band?

By Alex R. Martin and Russell S. Moomaw

Nebraska farmers have been using more and more herbicides over the past 15 years. More than 85 per cent of the row crops in Nebraska are now treated with herbicides and the figure is increasing. This trend holds true on farms across the country.

Herbicide use practices are changing, however. One change is a current trend toward broadcasting herbicides over the entire soil surface rather than banding them over the crop row. There are several reasons. One is that farm size is increasing and farmers must plant more acres quickly. Custom application of herbicides after planting (broadcasting) using large equipment, lets the farmer plant the crop without delaying to apply herbicides.

In addition, a trend toward narrower crop rows reduces the cost advantage of using a herbicide band. Close-drilled soybeans or grain sorghum require broadcasting herbicides.

High costs of fuel and reduced labor supplies encourage substituting herbicides for cultivation. Reducing the numer of tillage operations allows producers to farm more acres.

As reduced tillage and conservation crop production systems are developed, farmers rely more on broadcasting herbicides.

A rapid increase in the use of center pivot irrigation in Nebraska lets a farmer apply water and herbicide at the same time, which results in a broadcast application.

Several widely used herbicides must be incorporated into the soil before planting to prevent escape of the herbicide as a vapor.

Most incorporation methods now

(Continued on next page)

This farmer uses the band method of applying herbicide at planting time.

Herbicide . . .

require that the application be made before planting as a broadcast treatment. Herbicides that must be preplant incorporated include Eradicane, Sutan+, Treflan, Tolban, Vernam and Cobex. These herbicides are used largely as a broadcast treatment because it is difficult to incorporate them in a band over the row before planting.

Nebraska researchers have compared crop yields using the two methods with and without cultivation (Table 1). Because a band width of 12 to 14 inches (31-36 cm) proved to be most practical from this research, we considered this the best band width. Corn, grain sorghum and soybeans were chosen for study. Ramrod-atrazine was used on corn and grain sorghum. Amiben was used on soybeans.

Factors Differ

In comparing crop yields, remember that soil fertility, moisture conditions and other factors varied somewhat within the test area—just as they do in your fields. Small differences in yield are because of these field variations rather than because of weed control practices.

Yield of corn and grain sorghum was the same using either band broadcast treatment with cultivation. This indicates that with good herbicide performance in the row, plus cultivation, yields can be maintained if you use herbicide bands.

Broadcasting the herbicide without cultivating reduced corn yield but not sorghum yield. This was because Ramrod-atrazine on corn provided inadequate weed control, especially during one year of the experiment. Grain sorghum tolerated late season weed competition better than corn, so yields did not suffer.

Soybean yields using band and broadcast herbicide were equal when the crop was cultivated. Soybean yields were lower, however, when broadcasted with Amiben and not cultivated.

Each field and crop must be evaluated separately. If weed control is excellent with your broadcast herbicide treatment, there may be no reason for you to cultivate upland silt loam soils. Fine-textured bottomland soils may occasionally benefit from cultivation, even in the absence of weed growth.

One advantage of banding a herbicide is reduced cost. Herbicide costs can be reduced two-thirds on 40-inch (102 cm) rows and one-half on 30-inch (76 cm) rows by using a 14-inch (36 cm) herbicide band (Table 2). To realize a net gain, crop yields must be maintained.

Banding reduces the total amount of herbicide applied to each acre. This can be important when long lasting herbicides such as atrazine pose a carryover hazard. Tillage operations will mix the treated band with untreated soil, thus diluting the herbicide. This may allow a susceptible crop to be grown the next season, when it might not have been possible with broadcast applications.

Broadcasting a herbicide allows you to be more flexible in farming operations. Cultivation can be delayed to a more convenient time or even eliminated when the broadcast herbicide is performing well. This may allow more time for other farm work during the busy season.

Broadcasting rather than banding a herbicide is also a hedge against rainy weather, when timely cultivation may not be possible. Banding a herbicide requires cultivation to clean up row middles. During long rainy periods weeds could become large, making them more difficult to remove by cultivation when the wet weather ends.

You Decide

The decision to band or broadcast boils down to a savings of one-half to two-thirds the herbicide cost with banding, as opposed to greater flexibility, certainty and perhaps eliminating a tillage operation with broadcasting. Equal crop yields can be obtained with either practice. The best practice for one man may not be best for the next man. Whether or not the advantage of a broadcast herbicide treatment is worth the extra cost can only be answered by you. □

ALEX R. MARTIN is extension agronomist (Weed Science), RUSSELL S. MOOMAW is district extension specialist (Crops).

Table 1. Dryland crop yields and weed yields at Concord, Nebraska, 1969 to 1971, showing influence of broadcast or band herbicide application on crops grown in 30-inch (76 cm) rows.

Herbicide band width or broadcast treatment[1]	Mechanical tillage used	Weed Yield[2]						Crop Yield					
		Corn		Sorghum		Soybeans		Corn		Sorghum		Soybeans	
		lb/A	kg/ha	lb/A	kg/ha	lb/A	kg/ha	bu/A	kg/ha	bu/A	kg/ha	bu/A	kg/ha
No herbicide	One cultivation One rotary hoeing	650	728	1230	1378	2360	2643	100	6270	78	4891	25	1680
14-inch band (36 cm)	One cultivation One rotary hoeing	210	235	30	34	640	717	107	6709	109	6834	34	2285
Broadcast	One cultivation One rotary hoeing	0	0	0	0	260	291	116	7273	109	6834	36	2419
Broadcast	No cultivation One rotary hoeing	860	963	730	818	1410	1579	89	5580	102	6395	32	2150

[1]Ramrod-atrazine was applied to corn and grain sorghum at the rate of 5 lb/treated acre (5.6 Kg/ha). Amiben was applied to soybeans at the rate of 6 qt/treated acre (13.9 L/ha).

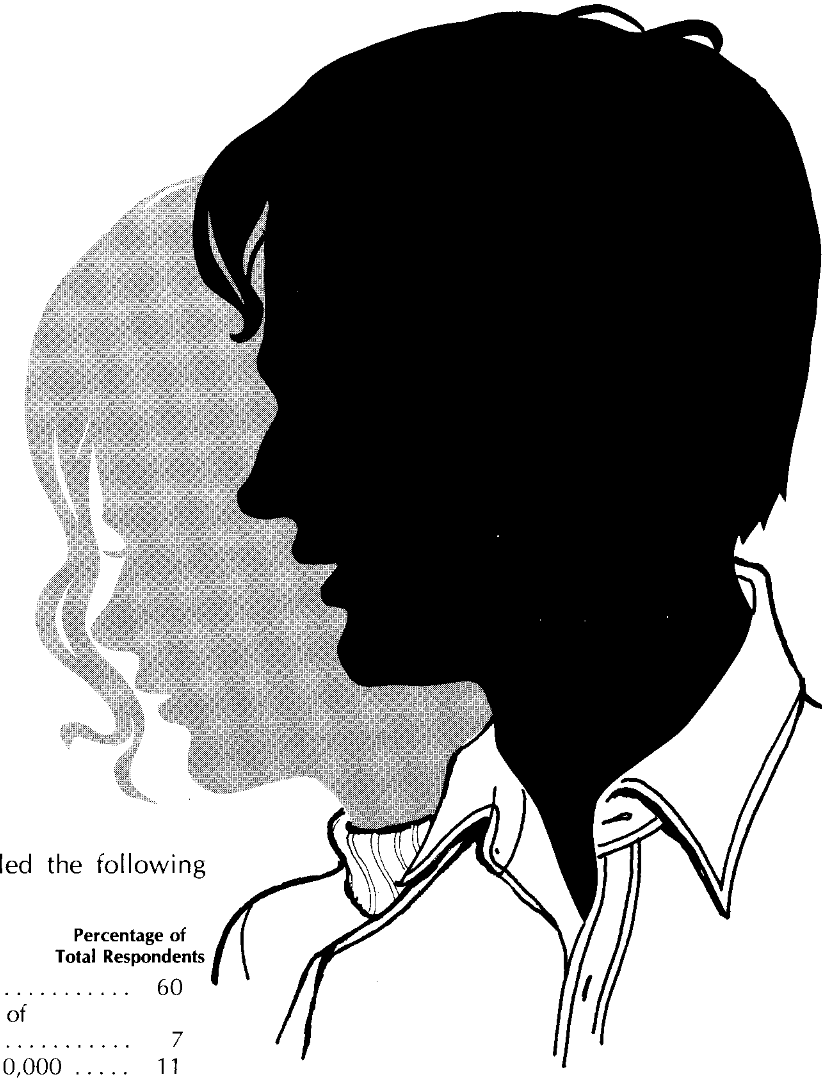
[2]Weed yields were taken at the end of the growing season before crop harvest.

Table 2. Cost comparison between band and broadcast applications.

Herbicide band width	Cost reduction using herbicide bands compared to broadcast in several crop row widths				Herbicide cost banded versus broadcast — Example: 30-inch (76 cm) row spacing			
	20" (51 cm)	30" (76 cm)	36" (91 cm)	40" (102 cm)	Herbicide Ramrod-atrazine[1] Price: $1.96/lb ($4.33/kg) Broadcast rate: 5 lb/A (5.6 kg/ha)		Amiben[1] $11.80/gal ($3.12/L) 6 qt/A (13.9 l/ha)	
	%				cost/A	cost/ha	cost/A	cost/ha
14-inch (36 cm)	30	55	61	65	4.41	10.89	7.96	19.66
Broadcast	---	---	---	---	9.80	24.20	17.70	43.72

[1]Examples are given for Ramrod-atrazine (corn and sorghum) and Amiben (soybeans) because these were the herbicides used in the research study. You can make your own cost comparison using your selected herbicide, based on current retail price and recommended rate/A.

Ag Students: The Changing Profile



By T. J. Helms and
T. E. Hartung

The dye is recast! In the past, the typical University of Nebraska College of Agriculture student was male, had a rural background and had experience in either crop production, livestock production and agricultural business, or a combination of these.

However, with increased enrollments of women and students with urban backgrounds, along with a doubling of the total enrollment inside of 10 years, the student audience has indeed changed.

Why have so many students decided to pursue agriculture as a profession? Who are these people we call freshmen? What experiences have our new students had prior to coming to the University? Where were these people living before coming to the University? The Why's, Who's, What's and Where's of our new students are important questions and members of the College of Agriculture must seek good answers if they are to do the best job of advising students.

Answers were sought through a new-student survey conducted in early September by professors of selected College of Agriculture freshman courses. A total of 428 responses were received, representing approximately 85 per cent of all new students, including approximately 85 women and 94 transfer students. The majority of respondents were students who intend to complete a four-year program leading to a Bachelor of Science degree in Agriculture.

The survey revealed the following information:

	Percentage of Total Respondents
Location of Home	
Rural	60
Rural Community of 500 or less	7
City of less than 10,000	11
City of more than 10,000	22
Work Experience	
On home farm/ranch	65
With farmer/rancher near home	37
Agribusiness	19
Non-agricultural job	38
Academic Experience/Rank in Graduating Class	
1st Quartile	51
2nd Quartile	19
3rd Quartile	7
4th Quartile	3
No Response	20
Extracurricular Involvement	
FFA	34
FHA	3
4-H	44
Scouting	13
Athletics	76
Instrumental Music	32
Choral Music	35
Other Activities (unspecified)	44
Location of Residence While in College	
University Dormitory	50
Home of Parents or other Relatives	16
Fraternity/Sorority	25
Cooperative	7
No Response	2
Source of Financial Support for Educational Program	
Scholarship awarded by the University	14
Scholarship awarded by non-University Source	16
Federal Loans/Grants	21
Parents	54
Part-time Employment	37

When asked, "Where would you like to be in 10 years and what would you like to be doing?", only a few respondents mentioned specific locations outside of Nebraska. Responses as to type of career they envision pursuing, listed in descending order of frequency, were as follows:

Back on the home farm/ranch	156
Working in some agriculturally related area	19
Wildlife manager	18
Forester; park manager	18

(Continued on next page)

Agribusiness (unspecified) ...	14
Farm/Ranch manager	12
Greenhouse operator/manager; florist; nurseryman	12
Veterinarian	11
Vocational agriculture instructor	8
Married, on home farm/ranch	7
Agricultural researcher	7
Landscape architect/designer .	5

Other professions receiving fewer than five responses were agricultural contractor, agricultural engineer, agricultural consultant, agricultural journalist, agronomist, architect, banker, county extension worker, dairy scientist, entomologist, feeder, marketing consultant, plant breeder, politician, soil scientist or conservationist and water resource manager.

If the sample of 428 represents the new students in the college this year, some conclusions can be drawn from the survey:

1. One-third have urban backgrounds.
2. More than two-thirds have had farm, ranch or agribusiness work experience.
3. More than two-thirds ranked in the upper 50-percentile of their graduating classes with one-half or more ranked among the upper 25 per cent.
4. At least 82 per cent are residing on or near the campus with another 16 per cent commuting from their homes or the homes of relatives.
5. More than half are receiving some or all their financial support from parents; more than half are being supported all or in part through loans, grants and part-time employment.
6. The majority entered the University with a clear purpose in mind.

So, the who, what and where of our new students have been answered somewhat. We answer the "why" with the question "WHY NOT?" That is, why not get involved in the most exciting, challenging career available? Agriculture! □

T. J. HELMS is assistant dean, College of Agriculture. T. E. HARTUNG is dean, College of Agriculture.

Infants Diets Studied With Mothers' Help

By Hazel Fox

Time was when all babies were breast fed at least for the first year and often until two years of age or later. Solid foods were seldom introduced to the child before seven or eight months of age.

The trend to formula feeding and the popularity of commercial infant foods has changed all that. Milk formulas which formerly were prepared by diluting and adding a source of carbohydrate to evaporated milk have largely been replaced by powdered infant formulas, more recently by liquid formulas, and now many infants receive "Ready to Eat," (RTE) formulas, sold as the name implies, complete with nursing bottle.

Infant cereals, fortified with iron, strained fruits, vegetables and meats have become standard infant fare. Cereals are often introduced to the infant shortly after his arrival home from the hospital.

Newly awakened interest in the nutrition of infants has focused attention on the kinds of foods they are fed. Obesity in infants is not uncommon and is believed to almost cer-

Babies are fed differently today than they were years ago. But are these changes good? UNL researchers are studying infants' diets in an attempt to draw up better guidelines for mothers.

Infants need proper diets to be happy and healthy like Alex Lowell, age five months. He is happily being held by his mother Marlene.

tainly persist into later childhood and adulthood. Bottle feeding may encourage overeating since mothers may have as their goal an empty bottle rather than a baby who knows when he has had enough to eat.

Feeding solid foods before age four to six months has not been proven to be beneficial. But neither is it definitely known to be harmful. Infants survive under a wide variety of feeding plans, which indicates they are very adaptable creatures.

Although trends in infant feeding practices are generally known, few studies of actual dietary practices of infants under one year have been undertaken. Such a study is underway now, however, in the Food and Nutrition Department at the University of Nebraska.

Mothers or prospective mothers of newborn babies are contacted and their cooperation is enlisted. During the first year, mothers are asked to record monthly the estimated food intake of their infants on two consecutive days. It is easy to measure the milk taken from a bottle, but measuring the intake of breast-fed infants poses a different problem. Babies are weighed before and after each feeding and the milk consumed is determined by the difference.

Mothers record kinds and amounts of solid foods eaten and also the kind and amount of nutrient supplement. They are also asked each month about new foods they have added to their infant's diet. The records permit calculation of caloric and nutrient intakes.

23 Studied

At this point 23 infants have been followed for periods ranging from 8 to 12 months. Bottle fed infants weighed from 5 lb. 6 oz. to 8 lb. 14 oz. (24.08–3976 kg) at birth, while those who were breast fed weighed from 6 lb. 12 oz. to 9 lb. 13 oz. (29.12–43.96 kg). Five of the bottle-fed babies weighed less than 7 lb. (31.36 kg) at birth while only two breast fed babies were below this weight. Mothers who planned to bottle feed may have restricted their diets more than those who planned to breast feed. Although weight restriction and smaller babies were popular for a long time, recently heavier babies are believed to have a better chance during the first few months of life.

All of the bottle-fed infants, but only one breast-fed infant, received solid foods during the first month of life. Six of 12 breast-fed infants received breast milk exclusively for the first six months. Preliminary calculations indicate that bottle-fed infants are receiving fewer calories and more protein than is presently recommended for infants. This may be more of a criticism of the recommendations than of the eating practices.

Contrary to expectations there appears to be no difference in weight gain of breast-fed and bottle-fed infants. In both groups, five infants doubled their weight in four months. All others except one child accomplished this feat by five months. Doubling weight in six months has been a general rule of thumb for gauging satisfactory growth in children.

Results of this study are incomplete, but when done, what will be its value? It is one way to check the nutrition of infants in their first year. We really do not know whether the nutritional guidelines for these important people have any relation to reality. Knowing what these children eat and how much they grow will help provide better future guidelines for infant feeding. □

HAZEL FOX is professor and chairman of the Department of Food and Nutrition.

How should you figure depreciation and trading methods? Tax time is here again and this article may help you decide.

Machinery Trading and Taxes

By Glenn A. Helmers and Myles J. Watts

Over the past several years machinery costs have rapidly increased.

As a consequence, farm operators have been "trading up" to larger tractors, combines and equipment. At the same time, the values of used machinery have been rising at unusually high rates.

These conditions mean that different depreciation methods and trading alternatives need to be considered. These longer-run consequences are difficult to project because tax regulations and economic conditions change. But it helps to make comparisons on the assumption that tax laws don't change.

In machinery trading, the book value of the older machine is added to the "boot," or trading difference, to establish the book value of the newer machine.

The more rapid the depreciation method you use, the lower the book value of the newer machine. The benefit of rapid depreciation is that the immediate income tax liability is lower. However, taxes are only postponed by trading because at the eventual sale (not trade) taxes must be paid on the gain above book value.

Also, rapid depreciation lowers the *depreciable basis* for a machine in future periods, and it lowers the resulting depreciation which may be taken. Depreciable basis is the book value minus the salvage value, or the amount of depreciation which may be claimed in the life of the machine. Therefore, rapid depreciation may not always be better than slower depreciation, even though income taxes can be delayed by trading.

Not Delayed

In addition, the alternative of not trading a machine but of selling the older and buying the newer machine without a trade in should be considered. Recaptured income tax is based on ordinary income and it must be paid on the difference between the market value of the used machine sold, minus its book value. It cannot be delayed as in trading. Investment credit is applied to the new book value of a machine.

If you buy and sell and don't trade, the new book value is the purchase price. The book value if you trade is the purchase price of the new machine minus the selling price of the old machine, or the "boot," plus the book value of the old machine. Because the selling price of the old machine is generally greater than its book value, the book value of the new machine if you trade is generally less than if you buy and sell. Thus, investment credit is greater when you buy and sell because the book value is higher. Also, because the book value is higher under the buying and selling option, the depreciable basis usually is greater, allowing for more depreciation over time.

Finally, maintaining a high book value by outright purchase means less income tax obligation when the machinery is eventually sold. At the time of the eventual sale, postponed taxes from trading must be paid. If a substantial amount of machinery is sold at that eventual sale, enough income may be generated to reach a higher income tax bracket. If this is the case, maintaining a high book value will be even more advantageous.

We have examined the consequences of three options 1) machine trading with rapid depreciation (20 per cent double declining balance with 20 per cent additional first year depreciation), 2) machine trading with straight line depreciation (10 years and 10 per cent salvage value), and 3) selling the older machine and purchasing new, using straight line depreciation (10 years and 10 per cent salvage value).

Currently, if additional first year depreciation is claimed, machines must have a useful life of six years and the amount of additional first year depreciation claimed must be limited to 20 per cent of $20,000 of property on a joint tax return. However, this does not mean that ownership must be maintained the full six years. Additional first year depreciation can only be applied to the "boot" when machines are traded. Machines must be held seven years to qualify for the full investment credit. Investment credit was assumed to remain at 10 per cent as a credit on income tax obligations for the future. Investment credit is based on the book value of the new machine.

A new tractor was assumed to be purchased in 1969 and 1976. The purchase price of the 1969 tractor was $8,000. Because of inflation of used machinery, the 1969 tractor was assumed to be valued at $8,000 in 1976 when a new tractor was purchased. The new tractor was considered to be purchased for $15,000 and declined in value to $7,500 in 1983 when a sell-out of the business was assumed. A 28 per cent tax bracket was assumed.

In Table 1 the results of the three alternatives are shown over the 14-year period. Looking at only the 1969–75 period, fast depreciation results in approximately an additional $1,618 of depreciation to lower tax liabilities over that period. This amounts to a $453 postponement of taxes in a 28 per cent tax bracket.

The resulting book values of the 1969 tractor in 1976 are lower for fast depreciation compared with straight line depreciation. Since in both trading cases it will cost $7,000 ($15,000–$8,000) to trade for the 1976 tractor, the book value of the new tractor will be lower under the faster depreciation method.

Because investment credit is based on the book value of the new machine, the investment credit for the slower method of depreciation will be $996 while the faster depreciation method will produce only $834 in investment credit in 1976. By selling the older machine, the purchase cost and book value of the new machine is $15,000, hence investment credit is $1,500. However, taxes must be paid on the difference between market value and book value ($8,000–$2,960) on the old machine under this alternative. At a 28 per cent tax rate $1,411 will be paid in increased taxes.

Difference Is Wide

The book value of the new machine in 1976 equals the book value of the old machine plus "boot" for traded machinery, or alternatively, the new machine cost when purchased outright. The difference in book value becomes very wide at this point (1976), $8,342 or $9,960 compared to $15,000. As a result, more depreciation can be claimed for the sell and buy alternative over the 1976 to 1982 period. Also, less tax recapture is due in 1983 for the sell and buy option compared with the trading options.

We assumed a sell-out for the tractors in 1983. If operations continued beyond 1983 the previous process would continue starting with the new book value in 1983. At some point, however, the machine will be sold, given away or be part of an estate. At that point, particularly if much machinery was sold in one year, these gains could be costly in taxes because income could be unusually high, pushing one into a higher tax bracket.

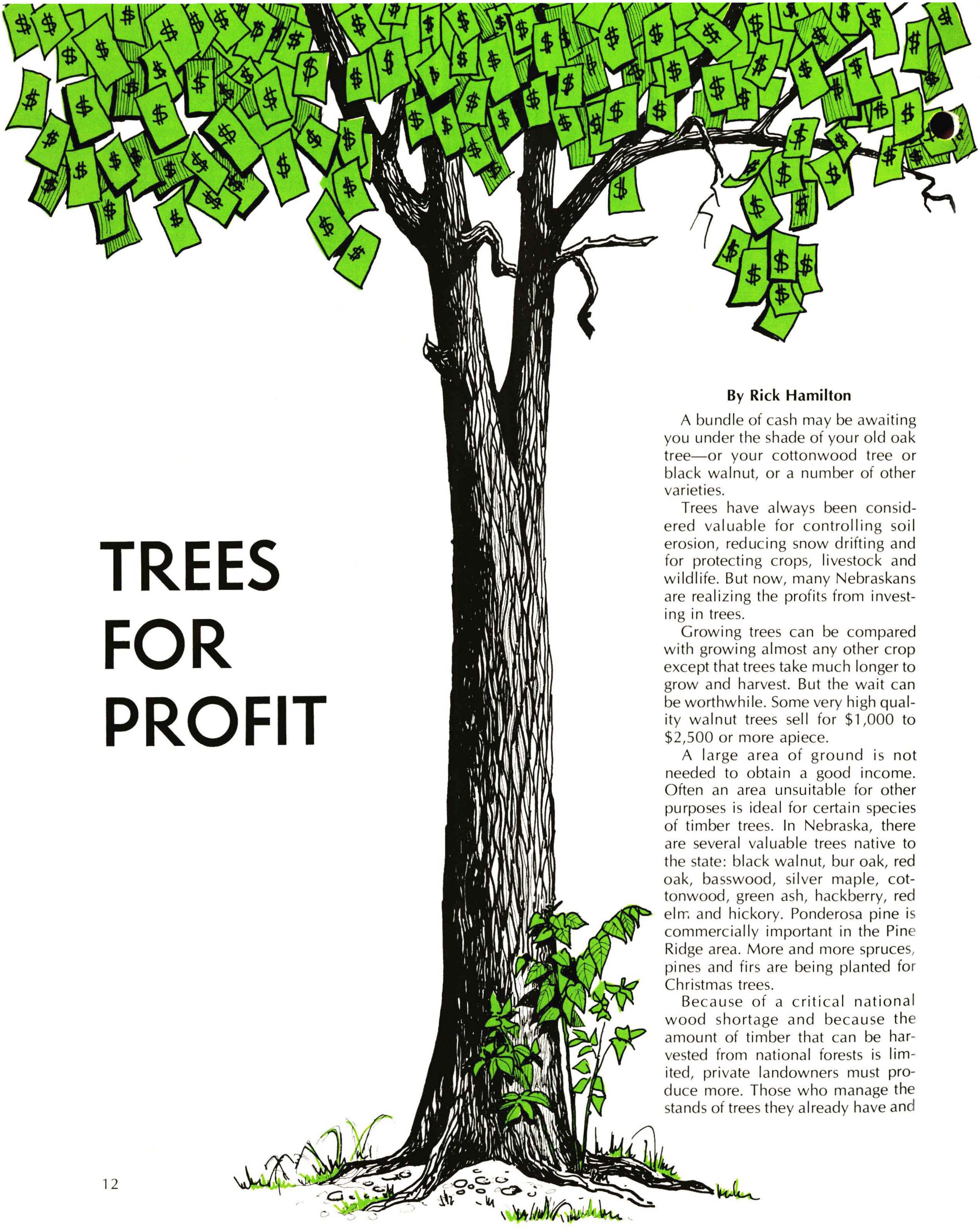
In summary, it becomes important to look at depreciation and trading methods in a longer-run context than just one trading period. The tax postponement advantages of trading and rapid depreciation may prove to be of advantage only in the short run. Over time it may be more important to maintain a higher book value for purposes of 1) investment credit, 2) higher future depreciation, and 3) smaller tax obligations at an eventual sell-out.

The results shown here illustrate general principles. The exact depreciation and trading strategy you should use depends on a number of factors, including capital availability and the time value of money. That is, an immediate one-dollar tax savings is more valuable than one-dollar savings in the future. How much more valuable depends on how short capital is and returns on alternative capital uses. If capital is in relatively short supply the delaying of income tax by use of rapid depreciation and trading becomes more important than when capital is less scarce. ☐

GLENN A. HELMERS is professor of Agricultural Economics. MYLES J. WATTS is instructor of Ag Economics.

Table 1. Comparison of trading tractors using two depreciation methods and a sell and buy new alternative.

	Trade Additional First Year Depreciation & Double Dec. Bal. Depreciation	*Trade* Straight Line Depreciation	*Sell Old & Buy New* Straight line Depreciation
	$	$	$
Depreciation 1969–75	6658	5040	5040
Book Value 1976 (old machine)	1342	2960	2960
Actual Value 1976	8000	8000	8000
Inv. Credit 1976	834	996	1500
Recapture 1976			5040X.28=1411
Basis (new machine) 1976	8342	9960	15000
Depreciation 1976–82	6886	6275	9450
Book Value 1983 (old machine)	1455	3685	5550
Actual Value 1983	7500	7500	7500
Recapture 1983	6045X.28=1692	3815X.28=1968	1950X.28= 546



TREES FOR PROFIT

By Rick Hamilton

A bundle of cash may be awaiting you under the shade of your old oak tree—or your cottonwood tree or black walnut, or a number of other varieties.

Trees have always been considered valuable for controlling soil erosion, reducing snow drifting and for protecting crops, livestock and wildlife. But now, many Nebraskans are realizing the profits from investing in trees.

Growing trees can be compared with growing almost any other crop except that trees take much longer to grow and harvest. But the wait can be worthwhile. Some very high quality walnut trees sell for $1,000 to $2,500 or more apiece.

A large area of ground is not needed to obtain a good income. Often an area unsuitable for other purposes is ideal for certain species of timber trees. In Nebraska, there are several valuable trees native to the state: black walnut, bur oak, red oak, basswood, silver maple, cottonwood, green ash, hackberry, red elm and hickory. Ponderosa pine is commercially important in the Pine Ridge area. More and more spruces, pines and firs are being planted for Christmas trees.

Because of a critical national wood shortage and because the amount of timber that can be harvested from national forests is limited, private landowners must produce more. Those who manage the stands of trees they already have and those who plant trees for the future will reap the high prices the timber shortage will bring.

If you plant trees on unused or "waste land," you will increase the land value and make better use of the property. Several things must be considered, however, to obtain a successful planting: 1) plant the species that will survive and grow best; 2) prepare the site as you would for any other crop. Woody vegetation and grass competition will choke out the seedlings; 3) control weeds with chemicals or by mechanical methods for at least three years; 4) watering will help, but is not usually needed if the right species are properly planted.

Proper management can greatly increase profits. In fact, Nebraska's woodlot owners receive more than $2 million annually. Unfortunately, because of poor harvesting practices and lack of management, most native trees are of low quality. Poor quality walnut trees, for instance, only bring from $10 to $30 a tree, compared with the $1,000 to $2,500 they could be bringing.

If you already have a woodlot, several management practices should be considered: 1) selective harvest of mature trees. This will yield an immediate income and will increase the vigor and growth of a second tree crop. If a second crop is not present, seedlings should be planted; 2) removal of undesirable trees. This provides growing space for crop trees and lets the sunlight through for the second tree crop. Small trees and undesirable species can be sold as firewood or chipped for use as bedding; 3) pruning crop trees. Proper pruning allows trees to form clear, defect-free wood. These are the moneymakers of the future. Pruning is especially important for high quality black walnut production.

The key to high profits is proper marketing. When you sell timber you are selling in a competitive market for the best possible price. The best technique is to offer timber for sale by sealed bids. Send bid forms to area timber buyers, along with a good map of the timber area.

A table showing the number of trees by diameter may encourage bidders. Allow bidders to make their own appraisals and to put their own prices on your timber. Do not tell bidders the amount of your volume estimate. It is good business to reserve the right to reject any or all bids.

Good business also dictates the sale be governed by a written agreement. A timber sale contract protects both buyer and seller from legal problems. It should be drawn up and agreed upon by both parties before harvesting begins.

Keep the contract as simple as possible. Several items are essential; 1) description, location, method of marking trees; 2) sale price, terms of payment, log rule used and volume of timber by species; 3) buyer's declaration of responsibility for personal injury, fire damage or other property damage; 4) harvesting methods and limitations; 5) location of roads and granting of rights of way; and 6) duration of the agreement. The contract should be signed by both parties, witnessed, notarized and registered.

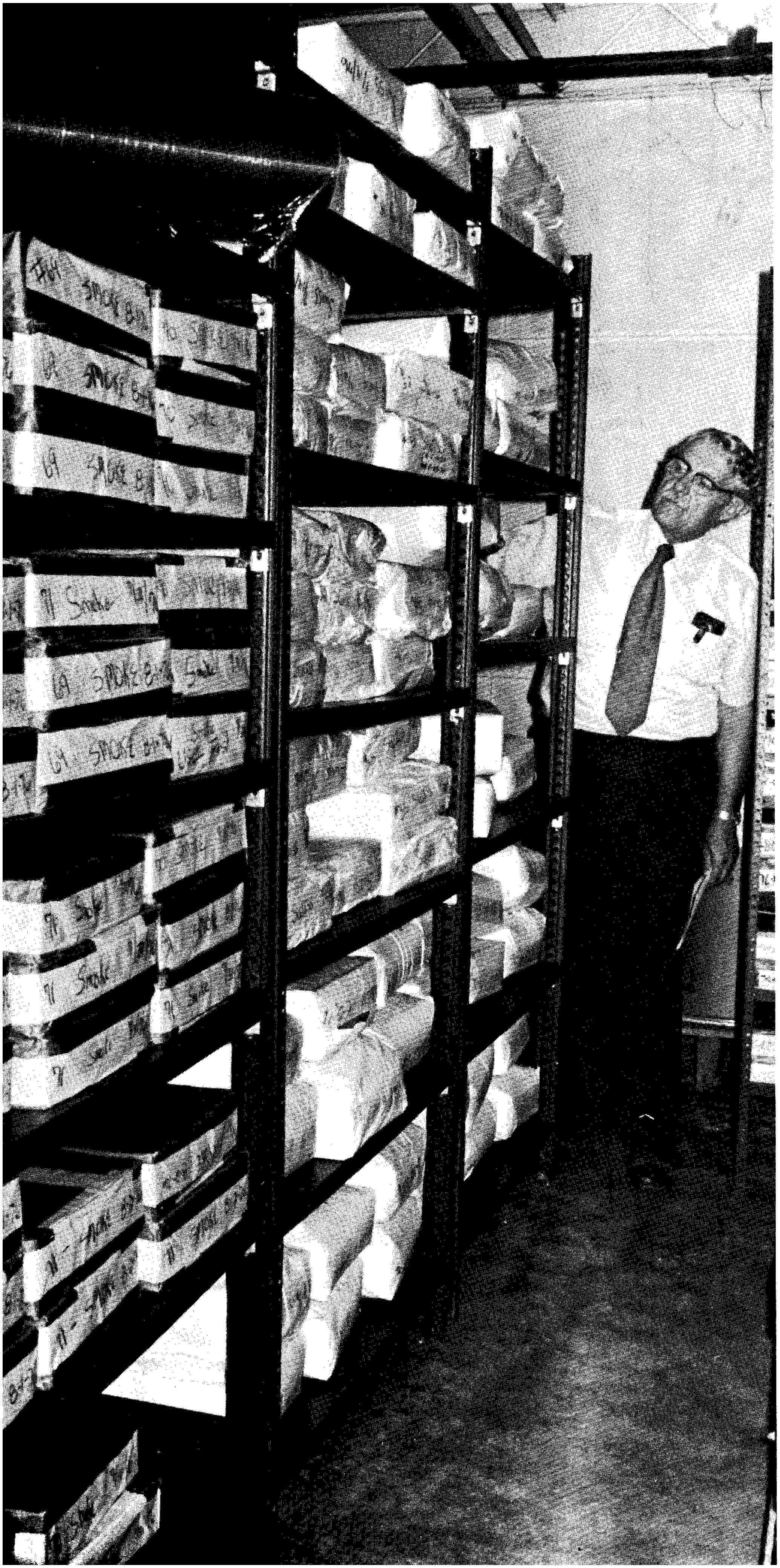
The Nebraska Department of Forestry is committed to increasing, improving and protecting the tree resource. Annually more than 2.5 million trees and shrubs are distributed through the Clarke-McNary program at approximate cost of production. Five district foresters are located throughout the state to provide information and assistance in all areas of forest management, protection and marketing. The district forester can be contacted through the county extension agent.

The Soil Conservation Service assists landowners who want to plant windbreaks and shelterbelts. Many Natural Resource Districts have extensive tree distribution and planting programs. Trees also can be ordered at the county extension office. ASCS cost-sharing programs are available for forestry practices in most counties.

Nebraskans once pointed with pride to their state motto "Nebraska—The Tree Planter's State," and trees planted as a crop will help carry on this rich tradition. □

With a little effort you could have a valuable cash crop on your land.

RICK HAMILTON is District Extension Forester for Extension District V.



Cheese is ripened in a cooler until it reaches just the right flavor. Evans checks the dates on several packages.

"Dairy Store" Serves Students, Staff and Stomachs

By Pamela Ury Schmidt

Say "cheese" and few people would think of the University of Nebraska.

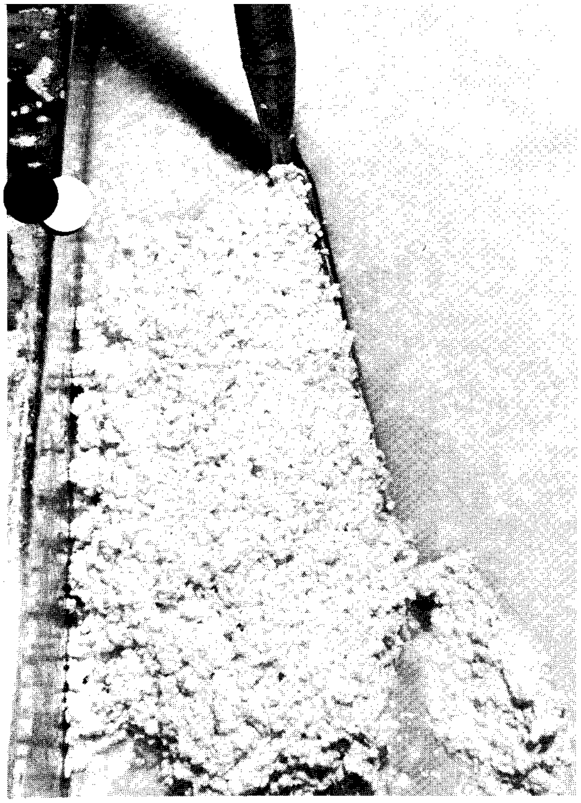
Although it is small in comparison to commercial operations, last year the Food Pilot Plant on the University's East Campus produced 30,000 pounds of cheese (13,500 kg)—enough to entirely fill one semi-trailer and part of another.

It also made enough ice cream to satisfy the sweet tooth of the most avid ice cream lover—23,000 gallons (87,000 l)—enough to fill four and a half semi-trailers.

The Food Pilot Plant is a non-profit operation which has been around for some 55 years. Its main reason for being, according to T. A. Evans, professor of Food Science and Technology, is to give staff members of the department the opportunity to conduct research in the processing of certain foods. Conditions in the pilot plant are most like those in a commercial plant. Students also can observe how these foods are made.

In fact, Evans is teaching a course this spring—"Dairy Products Processing"—in which students will learn first hand the techniques involved in processing and manufacturing dairy products. The Food Pilot Plant will be their laboratory.

Another class, called "Food En-



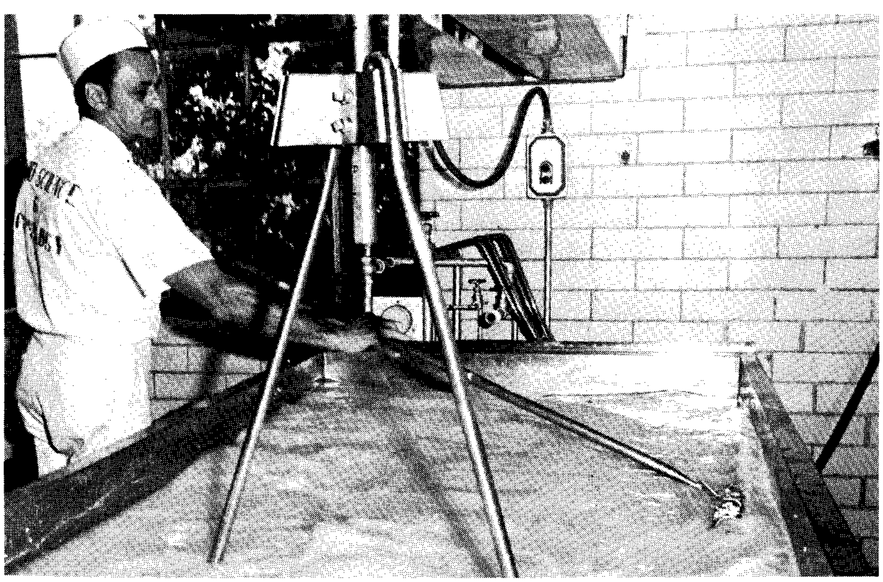
Above: These curds will eventually become cheese. Above right: The "eyes" in Swiss cheese are formed in these pressure boxes. The 20-pound blocks of cheese are left in the boxes for two to three weeks. Below: Merlyn Znamenacek, plant supervisor, stirs the curds and whey, which are contained in a double wall vat.

gineering," also will require that students have access to food processing equipment in the plant, according to Roy Arnold, chairman of the Food Science and Technology Department.

However, University students aren't the only ones to benefit from the presence of the pilot plant, Arnold said. Many school groups, and even senior citizens have toured the plant's facilities, thus getting a bird's-eye view of how dairy products are made.

Department researchers can conduct their research in laboratories up to a point, but they reach a stage when they must use equipment similar to that in a commercial plant, Arnold said. This is where the pilot plant comes in.

Five department researchers currently use the plant's equipment for a variety of projects. One is studying an antibiotic which inhibits the growth of mold on cheese. Another is researching practical uses of whey. Whey has good nutrition possibilities, but many commercial plants just throw it out.



In order to dispose of the food produced for learning purposes in the pilot plant—mostly cheese and ice cream—there is a retail sales outlet known to thousands of students, staff and townspeople as "The Dairy Store."

Few businesses could make it today without advertising, but word-of-mouth is still the store's primary means of becoming known. It doesn't take long for new students to find out where those ice cream cones are coming from, and a spring or summer day is bound to draw many people to the south end of Filley Hall for the frozen refreshment.

The only addition to word-of-mouth advertising is about a thousand brochures which are mailed yearly to potential purchasers of the store's best-selling item: the Christmas gift box. Between 3,000 and 4,000 of these are sold each year, according to Evans. Many individuals and organizations enjoy sending Nebraska-made cheese to friends, relatives and customers.

Gift boxes are mailed from the dairy store to nearly every state in the union, Evans said. About 70 per cent of the store's cheese is sold before Christmas in these gift boxes.

(Continued on next page)

Dairy . . .

One, two, four and six pounds of boxed cheese are offered. Enclosed in each package is a card stating that the cheese has been made by the Department of Food Science and Technology, of which the dairy store is a part.

Students, who make up the store's main work force, begin packing the boxes in October. Up to 30 students are employed, with one full-time supervisor in charge.

"We have no trouble getting workers," said Evans, "Many students work here for the experience."

Timing is very important when making dairy products. The mildness or sharpness of the cheese is determined by how long it is aged. Sharp cheeses, for example, can be ripened up to a year, while milder cheeses are aged about a month. Swiss cheese is aged four to five months.

Several varieties are produced, among them Husker cheese, developed at UNL by now-emeritus professor P. A. Downs. This is an uncolored, high-moisture, mild cheese, similar to Monterrey Jack. It is also the most popular cheese sold in the store.

Also available are various flavors of cheddar, including smoke and caraway; Iowa-style Swiss cheese, made from a process developed at Iowa State; and Colby. Blue cheese is also sold, but not made on the premises.

Dairy store products are made on a need basis. A lot of the demand depends on the season, special events and whether students are in town or on vacation. Predictably, more ice cream is made in hot weather, at State Fair time for a fair booth, and even for organizations' ice cream socials. A total of 40 to 50 flavors are made, with 20 to 25 offered at any one time.

Cheese is made sporadically, Evans said, with the Christmas season the busiest. Sour cream, most of which goes to University living units, also is produced throughout the year, amounting to 4,910 pounds (2,209.5 kg) last year. □

PAMELA URY SCHMIDT is editorial associate in Agricultural Communications.

Irradiation Holds Potential for Nebraska

By R. B. Maxcy

New food processing technology could be important to Nebraska. Processing adds value to food, and new processes may be particularly suited to Nebraska farm products.

Irradiation is a new technology with future potential. Raw food may be packaged and exposed to radiation. It may then be kept much longer and is safer than food treated in other ways.

The potential of irradiation processing of foods has been recognized for years. Much of the research and effort to commercialize the processes have been aimed at substitutions for present systems of processing and distribution. The concepts seemed simple, but actual applications brought on some complex issues.

Official acceptance has been one of the most challenging of these issues. Regulatory agencies require clear proof of benefits to society before a new process is accepted. The economic advantage could be shown, but questions about the process and its effect on food microorganisms remained. These only can be answered through more fundamental research. One such project is active in the Department of Food Science and Technology of the Institute of Agriculture and Natural Resources, Lincoln. Particular emphasis is directed toward the microbiology of red meat.

In order to evaluate the process, it's necessary to understand what happens to microorganisms in food during irradiation. Some microorganisms may survive, since certain processes may be designed to destroy most microorganisms, as is true with heat pasteurization of milk.

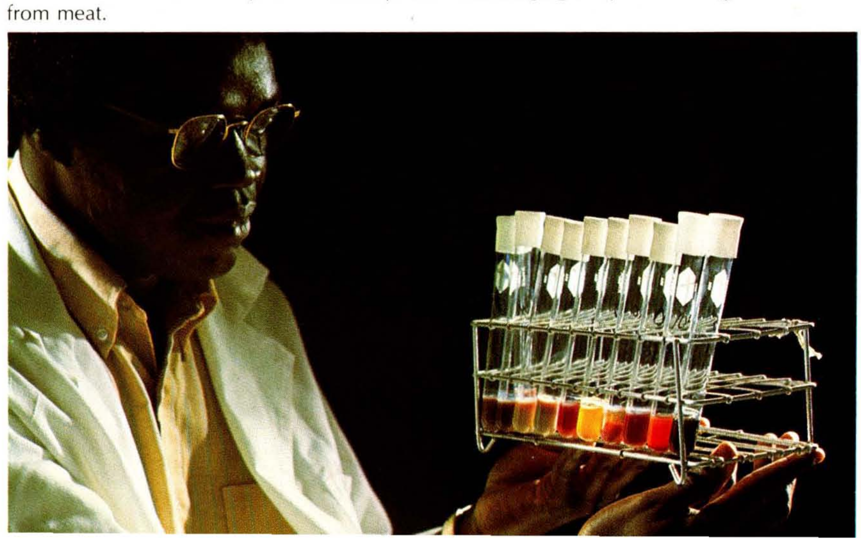
The nature of surviving organisms raises questions such as: What kinds of microorganisms survive? What will they do to meat? What will they do to mankind?

Answers to these questions require patience and persistence in long range research. Such work also needs patience from the public, which supports the research. Much time is required in building a store of scientific information from which "discoveries" are made. For example, Salk's discovery of the polio vaccine was made possible by years of fundamental research by numerous scientists. Similarly, we hope to build a store of scientific information to make irradiation processing possible in Nebraska.

The key to introduction and acceptance of irradiation processing of foods is proof of absolute safety or benefits that far exceed a minimal risk. Evaluation of the risks, if any, is made difficult, because radiation has continually involved a certain fear through association with nuclear weapons.

Furthermore, radiation is a form of energy that cannot be seen and people are afraid of the unknown, which probably influences the reg-

Graduate assistant Anthony Sikes contemplates a challenging array of microorganisms isolated from meat.



ulatory agencies. Never before have such stringent requirements been put on a process or product. Doubt is often expressed that the universally accepted process of heat pasteurization of milk or commercial availability of aspirin would have been accepted under these stringent guidelines. But, in this new era of public concern, it is necessary to prove the safety and benefits of a new process or product.

With irradiation processing, the microbiological aspects lead to the most questions. This process of microbe destruction, however, could eventually provide increased public health protection. Radiation should destroy disease-producing microorganisms, and the product's package would prevent further contamination. Consumers, in general, would be the ultimate beneficiaries through safer food supplies.

Work in the Department of Food Science and Technology deals with the nature of microorganisms that might survive radiation processing of meat. This work has been supported in part by the U.S. Atomic Energy Commission, the U.S. Department of Agriculture and the U.S. Army. The U.S. Atomic Energy Commission gave the Department of Food Science and Technology an irradiation unit capable of treating experimental quantities of food. The unit moves food into and out of a field of radiation. The surrounding area is protected and food does not contact the radioactive materials. The process is similar to putting food near a fire to be heated, yet the food is not in direct contact with the fire.

The microorganisms normally in commercial fresh meat are being isolated and studied to determine which ones are most resistant to radiation. Those with the greatest resistance are studied in detail to determine their nature, significance to meat quality and their potential public health significance.

Regulatory agencies interested in public health are concerned that microorganisms exposed but not killed in irradiation processing may be altered in such a way that their offspring could create a public health problem. Adequate information on this potential hazard is not available.

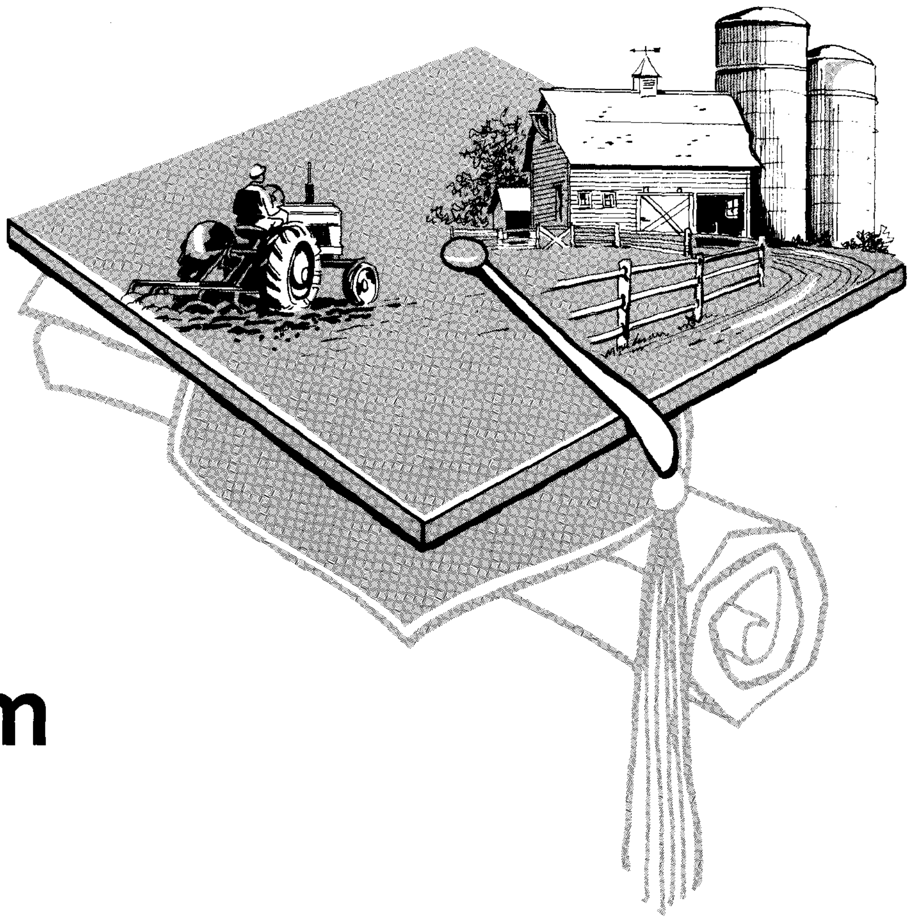
Dr. Maxcy can use this irradiation unit, which treats small amounts of food, for his studies on the new process. Above, he is using it to study the effect of radiation on bacteria within the test tubes. (Photos by Dick Dodds)

Data are needed from fundamental research in food microbiology to determine the nature of altered cells. This phase is progressing well in the Department of Food Science and Technology with scientific papers for review, evaluation and confirmation by other scientists. This method is common for acceptance of findings by the scientific community. The worldwide system of decision making by regulatory agencies is based on such scientific findings. Providing scientific information for the universal adoption of irradiation processing therefore may materially influence Nebraska products and economy, because of the local applicability.

When a new system of food processing is developed, location of the plant becomes important. There are some advantages to having the processing near the source of raw materials where there is natural fresh quality. Irradiation would increase the life of a fresh product. Meat, for example, could be processed, packaged and irradiated in Nebraska and sent to supermarkets in the industrial cities on the coasts. Processing increases the economic value, which is an opportunity for Nebraska to build on its economic base of raw material production.

Economic studies so far indicate there would not be a significant increase in the price of the retail food product. Mass production techniques, increased storage life and elimination of inefficiencies would offset the cost of irradiation processing. □

R. B. MAXCY is professor of Food Science and Technology.



Back to the Farm

By Ronald J. Hanson and Larry L. Bitney

Beginning a career in farming is extremely difficult for a young person these days. Real estate prices have climbed out of sight in the last few years, and the large amount of capital needed today for machinery, buildings, livestock and operating inputs is prohibitive.

In spite of these obstacles, record numbers of graduates at the University of Nebraska College of Agriculture are going to the farm.

One way a young person used to become a farm owner was to start the climb up the "farming ladder" as a farm laborer and with hard work and determination, to progress to a tenant, a part owner and finally to a full owner.

To begin today at the bottom rung of the ladder and reach the top during one's lifetime is practically unheard of. For most the climb would only be a frustrating struggle, and for some it would even end in failure. The hard fact is that without help and financial assistance from parents on the home farm, or even some land and equity capital to build from, getting started in farming from scratch is next to impossible.

The "entrance requirements" to farming have never been tougher. Staying informed of the constantly changing technology and economic conditions affecting agriculture is crucial to good decision making.

Possibly even more essential for success, a young farmer must be able to handle a heavy financial debt so he can expand his farming operation toward better efficiency and increased profits. Small per unit profit margins leave little room for errors even for an older, more experienced farmer. For the beginning farmer with a small equity to support his debt commitments, developing risk management strategies becomes essential to securing the necessary credit from lenders.

A college education is becoming more and more important to those returning to the farm. With rapidly changing technology and specialization in farming, more young persons want to continue their studies beyond high school in either a two- or four-year college program in agriculture. This allows the student to gain exposure to current research and to developments in the various fields of agriculture, helping to further update the present managerial level of the home farm.

With these challenges facing any young person attempting a start in farming, one might well expect fewer returning to the farm. However, the opposite is true. Over the past three years (1973 to 1975), a third or more of the graduates from the College of Agriculture at the University of Nebraska–Lincoln have started in farming (see Table 1).

This proportion of graduates returning to farms in Nebraska certainly reflects new optimism of agricultural graduates toward farming as a possible career. (See related article on page 7.) Several factors help explain the trend. Higher grain prices in recent years have raised net farm incomes to more favorable levels. Rapidly increasing land prices have multiplied the value of farm investments.

Even more important is the fact that farming has taken on a new image. Its importance to the United States economy and balance of trade, and to the world as the major food producer, now portray the farmer as a vital resource to our nation's future. Farmers are quickly gaining recognition as businessmen, rather than just tillers of the soil.

The ways in which a young person can get started in farming are rather limited. Current farmland prices prevent a young farmer from buying a farm and ever expecting to pay for it from the farm's earnings alone. Most farmers now starting out, or those continuing to expand by acquiring additional land, machinery and facilities, will be faced with a perpetual debt. Being able to generate debt dollars necessary for expanding the farm, and managing the financial risks involved will eventually (if not already) be a key to success.

Several Ways

Although other opportunities for getting started in farming are more limited, there are several possible ways.

Returning to the home family farm is probably the most common way to get started in farming today. Usually a father-son(s) partnership or farm family corporation is formed. Both a father and son should be well aware of the advantages and disadvantages a partnership or corporation offers. A partnership or corporation should be organized to match the interests, abilities and needs of each individual involved.

These agreements should clearly spell out the financial and managerial contributions by father and son, as well as the division of income between each. In most cases, the father may have to allow the son a larger share of the farm's income than his real contribution warrants so the son can earn a satisfactory living for his family.

The most important point to remember is that almost any variety of farm organization will succeed in a father-son operation if there is mutual trust and open communications and if the farm is operated on a business-like basis.

Another alternative for getting started is using rental or leasing arrangements as opposed to ownership. This allows a more efficient use of limited capital. In some cases, a son starts out in crop production by signing a note (usually to his father) for Dad's machinery, and renting some or all his father's cropland. Using custom hiring during harvesting can also eliminate or postpone a large investment in a combine or other harvesting equipment.

Enterprise selection offers another possibility. Young farmers with limited capital could start out by specializing in feeder pigs, for example, which require a moderate initial investment and a quick turnover of earnings for reinvestment.

Developing a good working relationship with farm lenders is important. Young farmers with little equity are quite vulnerable to financial failure if prices decline or crops fail, especially if they are faced with large annual debt repayments. Developing risk management strategies and keeping the lender well informed with complete and accurate farm records and financial budgets may allow a young farmer to expand his credit beyond normal lending limits. Encouraging the lender "to go out on a limb" at times may be necessary for a young farmer to secure credit needed for expansion.

Off-farm employment is another alternative for a young farmer and his wife. Outside income can be used to cover family living expenses during the years when the farm operation is just getting off the ground.

A young farmer may begin with part-time farming and continually invest part of his off-farm earnings into the farm business until it becomes a full-time operation. Moreover, outside income offers additional security to lenders that debt repayments will be paid on time, especially when farm earnings drop below expected levels.

There is certainly no magic formula for a young person starting out in farming; yet many have started by one or more of these routes and many graduates continue to do so. □

Table 1. Employment Occupations of College of Agriculture Graduates at the University of Nebraska–Lincoln for 1969–75.

	Year of Graduation				
Employment Category	1969	1971	1973	1974	1975
			(Percent)		
Farming or Ranching	12	25	36	38	33
Agribusiness or Industry	10	14	19	21	22
Graduate Study	15	15	15	15	15
Vo-Ag Teaching	15	5	6	5	5
Government	8	7	9	12	11
Military Services	31	16	5	1	1
Other or Undecided[1]	9	18	10	8	13
Total Per cent	100	100	100	100	100

[1]For 1975, this 13 per cent figure represented those with other types of employment (6%), those not seeking employment (1%) (i.e. usually female graduates who married), and those who did not respond to the survey (6%).

Source: College of Agriculture, University of Nebraska, Lincoln.

RONALD J. HANSON is assistant professor of Agricultural Economics. LARRY L. BITNEY is extension economist and professor of Agricultural Economics.

This man-made fire was set intentionally—not to destroy the forest, but to help it by burning dangerous forest fire material under controlled circumstances. (Photo by Judy Erickson, District Forester Assistant

FIRE comes to Pine Ridge

By Jerry L. Mohler and Donald E. Westover

Fire—one of man's best friends—can also become one of his worst enemies. It ravages homes and destroys millions of acres of timber each year.

Fire is no stranger to the Pine Ridge area in northwest Nebraska. In fact, it comes annually. In July 1973, fire came with particular fury, burning nearly 4,000 acres of Ponderosa Pine. The dead trees still remain, bearing mute testimony to the Dead Horse fire's awesome energy.

Fire also came to Pine Ridge in May 1976. But this time, it was a fire started by man to help the forest, instead of to destroy it. The purpose of the prescribed, or planned fire was to burn hazardous debris on the forest floor at a time when the burning could be easily and safely controlled.

Fire Hazard

A wildfire in this area in August or September after hot dry winds had parched the forest would have been extremely dangerous. The accumulation of pine needles and logging slash, coupled with the heat of summer, could easily result in a fire so intense that flames would reach into the crowns, or tops of trees.

When fire reaches the crowns the trees are killed and the fire spreads faster than men can control it. Crown fires, like the Dead Horse Fire of 1973, are a threat to the forests and to the people who live there.

The burn in May was a pilot study on four acres of forest on the Ben Pisaska Ranch, 10 miles north of Hay Springs, Nebraska. It was coordinated by the authors. A commercial thinning operation two years before had left many trees felled on the forest floor. A pre-burn inventory revealed more than 21 tons of downed woody material per acre. Removing these dangerous fuels was the purpose of the burn.

After selecting the location of the burn and obtaining the landowner's approval, the area was inspected and the proper location for the fire line was determined. Existing roads and ridges were used to make possible the construction of a good wide fire line.

New Technique

A relatively new technique was used to construct the fire line. Liquid ammonium polyphosphate fertilizer (11-37-0) was mixed with water to obtain a fire retardant solution. The solution (one part fertilizer and four parts water) was placed in the tank of a fire truck and sprayed at high pressure in two 18-inch strips about eight feet apart. These strips formed the outer edges of the fire line. After the retardant strips were layed the area between them was burned. The fire burned up to each strip where the grass and pine needles had been treated with retardant, and went out. The result was an eight-foot-wide fire line around the boundaries of the burn.

The fire line was completed on a Friday and the burn was scheduled for the next day, weather and fuel conditions permitting. Saturday morning a special spot weather forecast was obtained from the U. S. Weather Bureau at Rapid City, South Dakota. The burn site forecast predicted: winds from the southwest at 5 to 15 miles per hour (8-24 km); peak afternoon temperatures near 70°F (21.1°C); and minimum relative humidities in the afternoon near 20 per cent. Mid-afternoon fuel moisture had been running about 10 per cent for the past few days. Afternoon conditions were clearly too dangerous for burning. Weather and fuel conditions in the morning would, however, fall into the prescription for a hot, yet safe controlled burn.

It was decided to begin burning the area about 8:30 a.m. and to stop by 11 a.m. By doing this, it was possible to take advantage of the lower temperature and wind speed and higher relative humidity and fuel moisture of the morning hours.

Fuel moisture was checked before starting the burn and weather conditions were continually monitored as the burn progressed through the morning. The weather was monitored strictly as a safety precaution. As another precaution a dozen firemen and four pumpers were assembled, should they be needed to control the blaze.

Torches Used

Drip torches were used to ignite the fire. The torchman walked paral-

(Continued on next page)

"Only time will tell how the trees and grasses will respond, but if past burns are any indication, new grasses will soon cover the forest floor."

Fire . . .

lel to the fire line, a few yards upwind on the east side of the area. This allowed the southwest wind to carry the fire up to the fire line on the east side. Upon reaching the line, the fire (having no more fuel to burn) went out. In effect, this made the fire line even wider. Most of the burn site was on a north-facing slope.

Because fire burns rapidly upslope, the next step was to set a line of fire just downslope from the ridgetop, which formed the southern boundary of the burn. The fire burned upslope (into the wind) until it reached the south fire line and went out. Again the fire line had been widened. From this point on, all burning was done in the same way. Fire was lighted in a strip a few yards downhill from the last strip. The fire always burned into an ever widening firebreak. Since the fire was ignited in strips, the flaming front never gained enough momentum in its short uphill advance to jump the fire line.

The drip torches were extinguished at 11 a.m. and by noon all flames were out.

By early afternoon, two fire units from Hay Springs Rural Fire Department and another from Rushville Rural Fire Department were released with great appreciation for their presence at the burn, as were the Forest Service and Game and Parks Commission units.

Fire Watched

A three-man crew remained to patrol the fire until evening. The fire also was watched the next day to insure that no fire remained in the area.

The area was thoroughly blackened by the fire but forest managers have come to learn that most mature Ponderosa Pine can withstand the heat of a ground fire. The thick bark protects the cambium layer of Ponderosa, effectively insulating the tree from the heat of fire.

The only trees killed by a ground fire are those which receive too much crown scorch. Trees most susceptible are those with large piles of slash around their bases. While seedling mortality was quite high, the seedlings in the open, away from piles of slash, survived.

Thinning Needed

Killing seedlings is not cause for concern to the forest manager on the north slopes in the Pine Ridge. In fact, the seedlings seem to become established too easily and soon form dense "dog-hair" stands which are of little value if not thinned. These dense stands of young Ponderosa often constitute a threat to the forest because they are themselves a fire hazard. They can form a fuel ladder, helping a ground fire climb into the tall crowns of older trees, causing crown fires.

There are other benefits of fire besides reducing the fire hazard. Fire releases nutrients tied up in the dead fuels on the forest floor. It transforms those nutrients into a form more readily available to the living plants, and rainwater carries the nutrients into the soil.

With much of the litter and slash layer removed, fresh green grass will appear in a few weeks beneath the trees. This grass provides some good forage for cattle and wildlife. In many areas of the United States prescribed burning is done specifically for wildlife.

Forest pathologists are finding that the smoke from prescribed fire inhibits the growth of fungi responsible for certain tree diseases. One such disease, western gall rust, is common to the Pine Ridge area. Fire can result in a healthier stand of trees.

Nebraska foresters will be watching the burned area for some time to see just how the forest community animals and vegetation are responding after the fire. A post-burn inventory of the woody material and needles on the forest floor has already yielded some interesting results. The prescribed fire consumed 82 per cent of the twigs and branches with diameters of one inch or less and 78 per cent of the litter layer (mostly pine needles). These small fuels constitute the greatest fire hazard and they have now been significantly reduced.

Only time will tell how the trees and grasses will respond, but if past burn results are any indication, a lush new growth of grasses will soon cover the forest floor.

Fire came to the Pine Ridge all right—but this time it was not wildfire. This time it was planned and controlled, a management tool with a specific objective. The result will be a healthier forest community, one whose trees will be less likely to fall prey to wildfire. □

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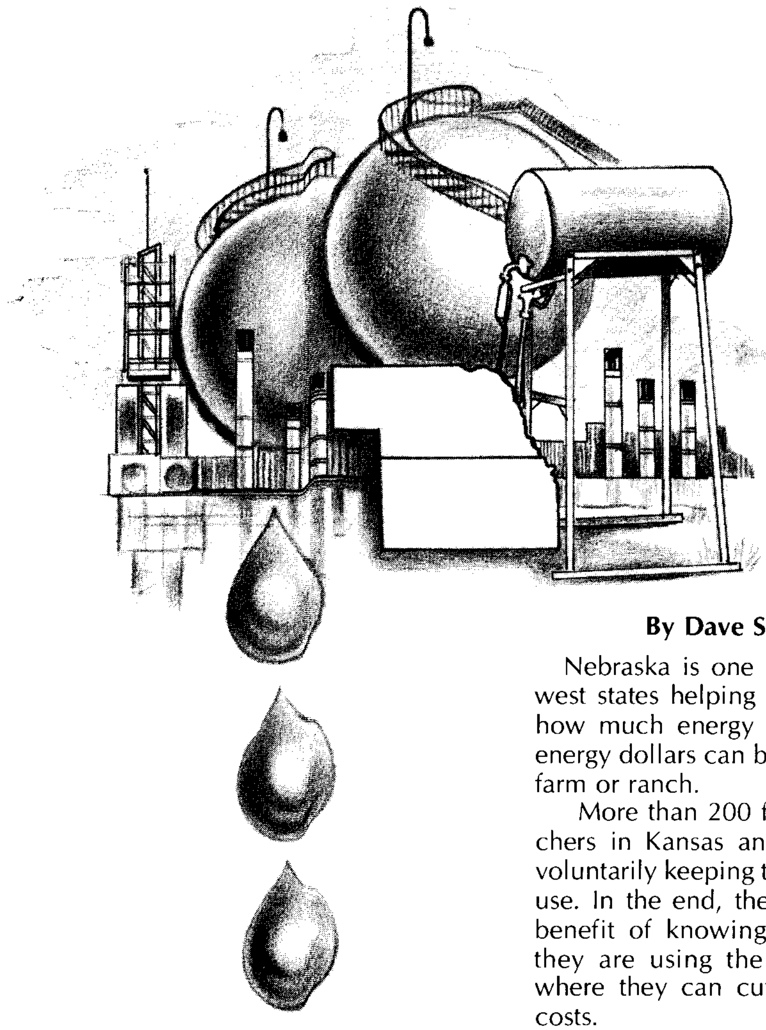

Farmers Keep Tabs On Energy

By Dave Shelton

Nebraska is one of the two midwest states helping researchers find how much energy and how many energy dollars can be saved on your farm or ranch.

More than 200 farmers and ranchers in Kansas and Nebraska are voluntarily keeping tabs on their fuel use. In the end, they will have the benefit of knowing exactly where they are using the most fuel and where they can cut down to save costs.

The project is in cooperation with the Federal Energy Administration (FEA) and the states' universities. Its purpose is to set up a pilot program for energy conservation on the farm. About 300,000 barrels of oil a day could be saved by 1985 through voluntary energy conservation programs on America's more than two and a half million farms.

These savings are possible if there is increased energy efficiency in areas such as field operations, irrigation, fertilizer application, crop drying and farm-to-market transportation. These savings can be achieved without hurting production or lowering the farmer's profit. The aim of the project is to develop a way to realize some of these potential savings.

Two phases are planned. The first of these is a fuel usage survey. The second is actual implementation, on a limited scale, of energy conserving practices. In Nebraska, more than 100 farmers and ranchers in 25 counties are involved.

The first phase, which will continue for at least one full farm production cycle, is in full swing. Each cooperating farmer has been supplied with fuel meters for his fuel supply tanks. He also has a number of specially designed "Energy Use Handbooks" for keeping fuel use records. Each time a vehicle or tractor fuel tank is filled, an entry is made in the handbook.

The booklets are periodically collected and the recorded data is entered into a computer, analyzed, and the results printed. With these results, it is hoped that accurate fuel use data for most of Nebraska's farming operations will be obtained.

The cooperating farmer will receive a summary sheet for each of his own operations, and for statewide averages. The results also will be evaluated to determine the most important areas for applying conservation methods.

The second project phase includes exhibits at farm field days, county fairs and the Nebraska State Fair. Field demonstrations showing practices such as proper wheel ballasting, gear up-throttle down, and machinery maintenance have been conducted, and others are planned. An irrigation scheduling program probably will be established as part of this phase.

The project is being conducted by the Agricultural Engineering Departments of the University of Nebraska–Lincoln and Kansas State

(Continued on next page)

Energy . . .

University. Besides the more than 200 cooperators in the two states, 45 to 50 county extension agents and the Cooperative Extension district directors are all involved to some degree with this program.

Each state has a number of industries, primarily agricultural, that are supporting the program. This support generally is in the form of loaning certain equipment an industry manufactures. Some of the loans have been two full-sized, fully equipped agricultural tractors, irrigation equipment, chisel plows, a tractor wheel changer and fuel meters. About a dozen industries have helped in this way with the project.

Some outside groups also have become interested in either the project as a whole, or in portions of the program. These groups include state agencies, public interest groups, farm organizations, youth organizations, farm equipment manufacturers, farm publications and farm equipment dealers.

Since the program began, there has been a dramatic and gratifying change in the overall attitudes of the people participating in the study. Many individuals started the study believing that too much time and effort would be required. They decided to try it for a while, however, making no commitment about continued participation.

After using the fuel meters and handbooks for a while, many of these same individuals are now urging us to continue the program for a longer time. By keeping the fuel use records, the participants can determine exactly where their fuel is going.

Even more improvement in attitudes probably will occur once some data feedback is available. Then each participant can see the breakdown and summaries of the records he has been keeping. He can then make comparisons and draw conclusions to reduce his current fuel consumption.

At the present time, the project is for 18 months, terminating in mid-1977. However, with the support and encouragement received, a time extension may be possible.

This two-state project serves two purposes: 1) obtaining an accurate idea of the amount of energy now consumed in agricultural operations; and 2) the testing of three basic hypotheses: a) that energy conservation in agriculture is practical and profitable; b) that a pilot program can be designed and effectively implemented at relatively low cost; and c) that significant statewide energy savings can result.

If this program proves successful in Nebraska and Kansas, its implementation will be recommended nationally. ☐

Finishing touches are added to one of more than 280 fuel meters being used for the energy conservation project.

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Research results of the Nebraska Agricultural Experiment Station are available to anyone regardless of race, color, religion, sex or national origin.

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